

CLAIMS

I claim:

1 1. A liquid depth sensing system with liquid
2 identification capability, comprising:

3 a liquid container having at least one peripheral wall and
4 a floor;

5 a gas delivery dip tube extending into said container, said
6 dip tube having an open lower end spaced at least slightly apart
7 from the floor of said container;

8 a pneumatic gas supply pump disposed externally to said
9 container, and communicating with said dip tube;

10 a differential pressure sensor communicating with said dip
11 tube and with ambient pressure;

12 a pump controller communicating electrically with said
13 differential pressure sensor and with said pump;

14 a liquid quantity and anomalous liquid detection processor
15 communicating electrically with said controller;

16 a liquid quantity indicator receiving signals from said
17 processor; and

18 an anomalous liquid annunciator communicating electrically
19 with said processor.

1 2. The liquid depth sensing system with liquid
2 identification capability according to claim 1, wherein said
3 pump comprises a miniature pump having an electrically actuated
4 pump drive integrally disposed therewith.

1 3. The liquid depth sensing system with liquid
2 identification capability according to claim 1, further
3 including an open loop pulse control circuit electrically
4 connecting said pump and said pump controller, governing the
5 pulse frequency of said pump in accordance with electrical
6 signals from said pump controller.

1 4. The liquid depth sensing system with liquid
2 identification capability according to claim 1, wherein said
3 liquid container comprises a closed container further including
4 a top, the sensing system further comprising a vent tube
5 extending into said container, the vent tube being
6 concentrically disposed about said dip tube and pneumatically
7 connected to said differential pressure sensor.

1 5. The liquid depth sensing system with liquid
2 identification capability according to claim 4, further
3 including a vapor pressure sensor disposed between said vent
4 tube and ambient atmosphere.

1 6. The liquid depth sensing system with liquid
2 identification capability according to claim 4, further
3 including a vapor temperature sensor disposed along said vent
4 tube.

1 7. The liquid depth sensing system with liquid
2 identification capability according to claim 1, wherein:

3 said container is open to ambient atmosphere; and

4 said differential pressure sensor is exteriorly vented
5 relative to said container.

1 8. A liquid depth sensing system with liquid
2 identification capability, comprising:

3 a liquid container having at least one peripheral wall and
4 a floor;

5 a gas delivery dip tube extending into said container, said
6 dip tube having an open lower end spaced at least slightly apart
7 from the floor of said container;

8 a miniature pneumatic gas supply pump and electrically
9 actuated pump drive integrally disposed therewith, disposed
10 externally to said container and communicating with said dip
11 tube;

12 a differential pressure sensor communicating with said dip
13 tube and with ambient pressure;

14 a pump controller communicating with said differential
15 pressure sensor and with said pump;

16 an open loop pulse control circuit electrically connecting
17 said pump and said pump controller, governing the pulse
18 frequency of said pump in accordance with electrical signals
19 from said pump controller; and

20 a liquid quantity indicator receiving signals from said
21 processor.

1 9. The liquid depth sensing system with liquid
2 identification capability according to claim 8, further
3 including a liquid quantity and anomalous liquid detection
4 processor communicating electrically with said controller.

1 10. The liquid depth sensing system with liquid
2 identification capability according to claim 8, further
3 including an anomalous liquid annunciator communicating
4 electrically with said processor.

1 11. The liquid depth sensing system with liquid
2 identification capability according to claim 8, wherein said
3 liquid container comprises a closed container having a top, the
4

4 system further comprising a tank vent tube extending into said
5 container, the vent tube being concentrically disposed about
6 said dip tube and pneumatically connected to said differential
7 pressure sensor.

1 12. The liquid depth sensing system with liquid
2 identification capability according to claim 11, further
3 including a vapor pressure sensor disposed between said vent
4 tube and ambient atmosphere.

1 13. The liquid depth sensing system with liquid
2 identification capability according to claim 11 further
3 including a vapor temperature sensor disposed along said vent
4 tube.

1 14. The liquid depth sensing system with liquid
2 identification capability according to claim 8, wherein:

3 said container is open to ambient atmosphere; and

4 said differential pressure sensor is exteriorly vented
5 relative to said container.

1 15. A liquid depth sensing system with liquid
2 identification capability, comprising:

3 a closed liquid container having at least one peripheral
4 wall, a floor, and a top;

5 a gas delivery dip tube extending into said container, said
6 dip tube having an open lower end spaced at least slightly apart
7 from the floor of said container;

8 a vent tube extending into said container, the vent tube
9 being disposed concentrically about said dip tube;

10 a miniature pneumatic gas supply pump disposed externally
11 to said container, and communicating with said dip tube;

12 an electrically actuated pump drive integrally disposed
13 with said pump;

14 a differential pressure sensor communicating with said dip
15 tube and with said vent tube;

16 a pump controller communicating with said differential
17 pressure sensor and with said pump; and

18 a liquid quantity indicator receiving signals from said
19 processor.

1 16. The liquid depth sensing system with liquid
2 identification capability according to claim 15, further
3 including a liquid quantity and anomalous liquid detection
4 processor communicating electrically with said controller.

1 17. The liquid depth sensing system with liquid
2 identification capability according to claim 15, further
3 including an anomalous liquid annunciator communicating
4 electrically with said processor.

1 18. The liquid depth sensing system with liquid
2 identification capability according to claim 15, further
3 including an open loop pulse control circuit electrically
4 connecting said pump and said pump controller, governing the
5 pulse frequency of said pump in accordance with electrical
6 signals from said pump controller.

1 19. The liquid depth sensing system with liquid
2 identification capability according to claim 15, further
3 including a vapor pressure sensor disposed between said vent
4 tube and ambient atmosphere.

1 20. The liquid depth sensing system with liquid
2 identification capability according to claim 15, further
3 including a vapor temperature sensor disposed along said vent
4 tube.